

**STUMP TREATMENT GUIDE BAR**

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## **STUMP TREATMENT GUIDE BAR**

### **Field of the Invention**

**[0001]** This invention relates to a guide bar for tree harvesting machines, the bar having a perforated conduit embedded in the opposing sides of the bar, the conduits connectable to a stump treatment material source and, more particularly, it relates to a valve arrangement for adapting the bar to different tree harvester machines by enabling connection to conduit from either side of the bar.

### **Background**

**[0002]** A basic guide bar adapted for treating stumps is disclosed in commonly owned U.S. Patent No. 6397452. That patent illustrates the provision of conduits that are seated in channels formed in the opposing sides of the bar. It further illustrates the connection of the fluid source to the conduit on the underside of the bar (understanding that either side may be the underside and the bar is typically inverted over time so as to extend the wear life of the bar).

**[0003]** What is not evident from the above patent or prior art is that different tree harvesting machines have different routes for connecting the treatment material source to the guide bar. One route directs the flow of liquid to the top of the bar and the other directs the flow of liquid to the bottom of the bar, both feeding the conduit on the underside of the bar.

**[0004]** As shown in the partial cross-sectional view of a guide bar of FIG. 2, currently, to accommodate both feeding routes, receiving inlets 234, 236 are provided at both sides of bar 222 and penetrate conduit 240. As shown, side 244 is the under side

where treatment material will be dispersed through perforations 246 in conduit 240. Plug 230 prevents the treatment material from escaping through near end 232 of conduit 240. Currently, when a bar is purchased, the purchaser must determine which of the inlet 234, 236 is the correct inlet for his or her machine and the opposing side inlet to that conduit needs to then be sealed, otherwise it becomes an outlet for the treatment liquid. Such sealing has been heretofore achieved by providing the bar purchaser with a plug sized to fit inlets 234, 236, which is usually manually inserted in the unused inlet.

**[0005]** Inserting the plug into the inlet is an undesirable, time-consuming and oftentimes awkward task. And, if the plug is improperly inserted or if the plug is dropped, lost or not inserted at all, the user will experience an undesired outflow of treatment material onto the machine and ground. This can render the flow of the treatment material onto the stump surface insufficient, and can also increase costs.

**[0006]** The present invention is directed to the resolution of the above-described problem whereby the insertion of inlet plugs is avoided.

### **Brief Description of the Invention**

**[0007]** Whereas the inlets for the conduit are directly opposite each other, whereas they are typically located near the inner end of the conduit and whereas the ends of the conduits are usually sealed by plugs at the point of manufacture, one preferred embodiment includes modification of the end plugs at the inner ends of the conduits so as to incorporate a check valve as a part of the end plug. The check valves

may be open or closed biased, and are reactive to the pressure applied by the treatment material as it is introduced to an inlet.

**[0008]** In some embodiments, the end plug may carry the check valve. In a closed biased setup, a portion of the valve opens in response to the treatment material flow, thereby allowing the treatment material into the conduit, while a portion of the valve remains closed at the opposed inlet to prevent unwanted outflow. In an open biased valve configuration, the force of the treatment material causes the valve to close off the inlet where the treatment material is not being introduced and thus preventing unwanted outflow.

**[0009]** In other embodiments of the present invention, the check valve is not carried by the end plug, but may still have either an open or closed biased setup that is reactive to the introduction of treatment material. For example, a flexible or collapsible layer may be applied adjacent to a portion of the conduit inner wall and covering the opposed inlets. Fluid directed through one of the inlets forces the portion of the layer covering the inlet to collapse, thus allowing the treatment material to flow into the conduit while the portion of the layer overlaying the opposed inlet remains closed preventing outflow. Further versions are contemplated and several are illustrated and described in the detailed description that follows and which have reference to the accompanying drawings.

#### **Brief Description of the Drawings**

**[0010]** The invention is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings, in which the like references indicate similar elements and in which:

[0011] **FIG. 1** illustrates a stump treatment guide bar coupled to a tree harvester;

[0012] **FIG. 2** illustrates a cross section of a portion of a known stump treatment guide bar;

[0013] **FIGs. 3A and 3B** illustrate cross-sectional views of a portion of a guide bar in accordance with a first embodiment of the present invention;

[0014] **FIGs. 4A and 4B** illustrate cross-sectional views of a portion of a guide bar in accordance with a second embodiment of the present invention;

[0015] **FIG. 5** illustrates a cross-sectional view of a portion of a guide bar in accordance with a third embodiment of the present invention; and

[0016] **FIG. 6** illustrates a cross-sectional view of a portion of a guide bar in accordance with a fourth embodiment of the present invention.

### **Detailed Description**

[0017] In the following detailed description, reference is made to the accompanying drawings which form a part hereof wherein like numerals designate like parts throughout, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. Therefore, the following detailed description is not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims and their equivalents.

[0018] **FIG. 1** illustrates an example of a stump treatment guide bar interconnected to a tree harvester. Boom 10 of a tree harvester has a head portion 12

that includes grapples 14 and a cutting assembly 16 pivotally mounted thereon. Cutting assembly 16 includes a cutting chain 21 mounted for driven rotation around a guide bar 22. As the grapples 14 encircle and then grip the trunk of a tree 24, cutting assembly 16 is then pivoted into and through the tree 24 as indicated by arrows 25. As the cutting assembly 16 cuts through the tree 24, the flat underside of bar 22 slides along or in close proximity to the exposed surface 28 of the stump. It is this exposed surface 28 that needs treating.

**[0019]** For treatment of surface 28, a channel 32 may be formed in each of the bar sides (FIG. 1 being a view from the upper side of the bar and the underside channel is shown in dashed lines). A conduit 30 is secured in the channel 32 and is connected to a treatment material source 20 at either opposed inlets 34, 36, depending on which side the tree harvester is configured to dispense such treatment material. As illustrated, source 20 is connected to inlet 36 on the top side of bar 22 by line 26. Again, other harvesters may be configured to interconnect the treatment material source 20 with inlet 34 on the underside of guide bar 22.

**[0020]** Outlet holes or perforations 38 may be formed in conduit 30 and open to the underside of the bar 22. The perforations 38 adapted to direct the treatment material from conduit 30 onto surface 28. It can be appreciated by one skilled in the art, however, that perforations 38 can be formed in conduit 30 at the point of manufacture, or they can be formed by the user to customize the necessary application of treatment material depending, for example, on the material being dispersed and/or the trees being cut.

**[0021]**        **FIGs. 3A and 3B** illustrate cross sectional-views of a portion of a guide bar in accordance with a first embodiment of the present invention. Guide bar 322 is similar to those described with respect to FIG. 1, having channel 332 formed therein. Conduit 340 has a near end 318 and an outside end (not shown), and is disposed in channel 332 such that perforations 346 are positioned at or near the underside 344 so treatment material can flow out therefrom and treat the stump exposed surface (not shown, but shown in FIG. 1).

**[0022]**        Plug 330 is positioned in the near end 318 of conduit 340 to prevent treatment material from exiting therefrom. Plug 330 carries a check valve 350. As illustrated, check valve 350 is a generally tubular-shaped hollow extension of plug 330 that is substantially pliable or collapsible such that it may conform to the inner surface of conduit 340. The tubular extension 350 extends to a point past the receiving inlets 334, 336. It is preferable that the outer diameter of the tubular extension check valve 350 be substantially the same as the inner diameter of the conduit 340, so that the extensions 350 cover inlets 334, 336, thus creating a closed biased arrangement. It can be appreciated, however, that the outer dimension of the tubular extension could be slightly larger, particularly where the selected material is pliable such that it may deform to fit within conduit 340.

**[0023]**        FIG. 3B illustrates the response of the check valve 350 when treatment material is introduced from the source (not shown) through inlet 334. As the treatment material is directed through inlet 334, it causes the portion of check valve 350 that is covering inlet 334 to deflect or collapse inwardly as indicated by directional arrow 352. This deflection in response to the treatment material flow thereby opens inlet 334 and

allows the material to flow into conduit 340 and out perforations 346, thereby performing the stump treatment process.

**[0024]** The treatment material is prevented from flowing out of inlet 336 in part because the portion of check valve 350 covering inlet 336 does not deflect inwardly, and thus remains in the closed position. Depending on the pressure at which the treatment material is introduced, the deflecting portion of check valve 350 may also push against the portion of check valve 350 that remains in the closed position over inlet 336, thereby enhancing the seal of inlet 336 and increasing the resistance to undesired outflow.

**[0025]** The arrangement shown in FIG. 3B is one where the tree harvester (not shown) is configured to insert treatment material from the under side 344 of the guide bar 322 through inlet 334. However, check valve 350 will function as described where a tree harvester is used that dispenses treatment material from the top side 342 through inlet 336. In such a case, the portion of check valve 350 that is covering inlet 336 will deflect inwardly thereby allowing treatment material to flow into conduit 340. The presence of the portion of check valve 350 covering inlet 334 will remain in place and prevent outflow of treatment material therefrom.

**[0026]** It can be appreciated by one skilled in the art that the cross-sectional dimension of check valve 350 may also be smaller than the cross-sectional dimension of conduit 340, which would create an open biased arrangement. When the treatment material is introduced, it will cause the deflection of the tubular extension such that it covers the opposing inlet.

**[0027]** **FIGs. 4A and 4B** illustrate cross-sectional views of a portion of a guide bar in accordance with a second embodiment of the present invention. As with FIGs.



3A and 3B, Guide bar 422 has channel 432 formed therein. Conduit 440 has a near end 418 and an outside end (not shown), and is disposed in channel 432 such that perforations 446 are positioned at or near the underside 444 to allow treatment material to flow therefrom and treat the stump exposed surface (not shown).

**[0028]** A plug 430 is positioned in the near end 418 of conduit 440 to prevent treatment material from exiting therefrom. Plug 430 carries a check valve 450. Check valve 450 consists of a generally planar flap that extends outward from the inner end 431 of plug 430 in a substantially parallel manner to conduit 440, to a point past the opposing inlets 434, 436. In its neutral position, the flap of check valve 450 generally maintains a substantially similar distance from inlets 434, 436, thus leaving inlets 434, 436 in an open biased position.

**[0029]** As shown in FIG. 4B, when treatment material is directed into inlet 434, check valve 450 deflects toward opposed inlet 436, as shown by arrow 452. When deflected, check valve 450 is forced against inlet 436 thereby sealing it such that undesirable outflow of the treatment material there through is prevented without the need for inserting a plug into inlet 436.

**[0030]** Though check valve 450 is shown to be substantially flat, it can be appreciated by one skilled in the art that the cross-sectional shape of flap portion of the check valve 450 can be varied, while still achieving similar results. For example, the flap cross sectional shape could be more oblong in order to better match the inner curvature of the conduit 440 at the inlets 434, 436 and thus encourage a better seal.

**[0031]** Also, as discussed with FIG. 3B, the illustrated configuration anticipates a tree harvester that is configured to direct treatment material from the under side 444 to

inlet 434. However, it can be appreciated that the same result may be achieved if treatment material is directed to inlet 436 on the top side 442. In such a case, though not shown, check valve 450 will deflect in response to introduction of treatment material through inlet 436 thereby forcing the flap of check valve 450 against opposed inlet 434, and thus sealing it to prevent unnecessary outflow.

**[0032]**        **FIGs. 5 and 6** are cross sectional-views of a portion of a guide bar in accordance with additional embodiments of the present invention where the check valve is not carried by the plug. **FIG. 5** illustrates a check valve 550 which operates similar to the tubular extension check valve embodiment shown in FIGs. 3A and 3B, except plug 530 does not carry the check valve 550. Instead, check valve 550 is a flexible layer of deflectable material residing adjacent to the inner wall of conduit 540 at the near end 518. Flexible layer check valve 550 extends past the inlets 534, 536 thereby maintaining a closed bias. When treatment material is directed into inlet 536, for example, the portion of the flexible layer of check valve 550 that covered inlet 536 deflects toward opposed inlet 534, as shown by dashed lines 550' and arrow 552. This allows the treatment material to flow into conduit 540 without flowing out of inlet 534.

**[0033]**        Flexible layer check valve 550 can be held into place by plug 530 at the inner end 518. Though not shown, inner end 518 can also be crimped or otherwise sealed to prevent out flow, as well as hold tubular layer check valve 550 in place.

**[0034]**        **FIG. 6** illustrates another embodiment of a guide bar in accordance with the present invention where the check valve is not carried by the plug. As shown, check valve 650 is similar to and correspondingly functions like the planar flap check valve described in FIGs. 4A and 4B. But, instead of being carried by a plug, the check valve

650 is held in a position between the opposing inlets 634, 636 by the deformation or crimping 633 of near end 618 of conduit 640. Check valve 650 extends from the crimping 633 to a point past inlets 634, 636. When treatment material is directed into conduit 640 through inlet 634 on under side 644, for example, check valve 650 deflects toward opposing inlet 636 as shown by 650', thereby sealing inlet 636 and preventing undesirable outflow. Likewise, if treatment material is directed through inlet 636, check valve 650 will deflect toward opposing inlet 634 as shown by 650'', thereby sealing inlet 634 and preventing undesirable outflow.

**[0035]** Check valves described above can be made out of a variety of materials depending on a variety of factors. It is preferable that the check valves be made of a pliable material that will be responsive to the pressures induced by the flow of treatment material. Examples of such a material are many polymer-based rubber materials, including, but not limited to, polyurethane, polypropylene and the like. Finally, it can be appreciated by one skilled in the art that the end of the conduit can be sealed or crimped in a variety of ways in addition to that shown in the figures, without departing from the scope of the invention.

**[0036]** It can also be appreciated that there may be a slight advantage of the closed biased check valve embodiments (*i.e.*, the tubular extension check valve embodiment illustrated in FIGs. 3A and 3B and flexible layer check valve embodiment illustrated in FIG. 5) over the example open biased flap check valve embodiments of FIGs. 4A and 4B, and FIG. 6. The former check valves eliminate the potential need to orient the plug as may be required of the latter flap check valves, *i.e.*, so that the plane of the flap is positioned perpendicular relative to a center line passing through the

opposing inlets. Also, the closed biased configuration of the tubular extension check valve and flexible layer check valve embodiments will prevent treatment material from flowing out of the inlets when the treatment material is not being directed to the guide bar from the source (e.g., when moving from one tree to the next).

**[0037]** Although specific embodiments have been illustrated and described herein for purposes of description of the preferred embodiment, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent implementations calculated to achieve the same purposes may be substituted for the specific embodiment shown and described without departing from the scope of the present invention. Those with skill in the art will readily appreciate that the present invention may be implemented in a very wide variety of embodiments. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.